Undergraduate Motivations for Participating in Afterschool Programs

A Case Study of The STEMinist Program

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Undergraduate students are a critical resource for university-community programs that provide enriching learning opportunities for school-age youth who have limited exposure to science, technology, engineering, and math (STEM). Many universities offer afterschool outreach programs that enable youth to interact with science faculty, and many such programs depend on undergraduates as facilitators. However, education research has focused on the youth served rather than on the undergraduates who facilitate the outreach programs.

To study why undergraduates participate in youth programming, we conducted a qualitative exploration of the experiences and perspectives of women undergraduates who facilitated an afterschool program that engages girls and nonbinary youth with scientists and engineers of similar gender identities. We focused on identifying the motivations and interests of these undergraduate facilitators in an effort to understand their views about the potential benefits of participa-

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tion. Our study sheds light on undergraduates' reasons for devoting time and energy to university-community STEM programs. Our findings may help other university-community programs grow in their support of undergraduate facilitators.

Study Rationale

University-community partnerships leverage the resources of various stakeholders—including research faculty, graduate and undergraduate students, and community leaders—to strengthen the K–12 STEM pipeline through the interactions of research, policy, and community practices (Denner et al., 1999). As afterschool programs have moved to the forefront of efforts by national educational policymakers to increase the cultural and linguistic diversity of college STEM majors (Granger & Kane, 2004), university-community partnerships have arisen to develop afterschool programs (Hudson & Hudson, 2008). Reported motivations for engaging school-age youth in afterschool programs include reducing societal discord (Newman et al., 2000), promoting personal well-being and social skills (Durlak & Weissberg, 2007), and informing or inspiring future career choices (Tyler-Wood et al., 2012). The positive youth outcomes from university-community partnership programs stem from interactions between youth participants and undergraduate facilitators (Cole & Distributive Literacy Consortium, 2006). Although research has shown that the interactions between undergraduate facilitators and youth may be mutually beneficial, relatively few studies have examined the potential benefits for the facilitators (Nelson et al., 2017).

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Because university-community afterschool programs depend on undergraduate facilitators, supporting these students' development should be a priority for program developers and coordinators. For example, they can encourage the development of professional skills that undergraduate facilitators can apply to future educational or career opportunities. The National Association of Colleges and Employers (2014) reported that over 70 percent of employers sought leadership, teamwork, positive work ethic, and communication skills in their future employees. However, employers reported that many college graduates lacked such leadership and organizational skills (Dostis, 2013). Research suggests that undergraduate mentoring experience is a predictor for strong work skills. For example, Good et al. (2000) found that undergraduate mentors who tutored youth had strong critical thinking and problem-solving abilities, as well as heightened communication and leadership skills. However, these studies have not focused on the perspectives of the undergraduates themselves, who have been largely overlooked in research on youth programs.

Program Context and Undergraduate Facilitator Roles

The STEMinist Program began in 2016 through a partnership between a Southern California university and two local Girls Inc. chapters. The program exposes girls and nonbinary youth (ages 9–11) and teens (ages 12–18) to women and nonbinary scientists through STEM activities in the hope of increasing participants' interest and confidence in pursuing STEM studies and careers. The program follows a design-based research framework (Barab & Squire, 2004): Program components are subject to annual revision informed by all key stakeholders, especially participating youth (Nation et al., 2019). Our study focused on the 2019–2020 school year, which was the fourth year of the youth program and the second year of the teen program. The design called for undergraduate facilitators to work with their participant groups for one hour each Wednesday for 20 weeks.

Roles of Undergraduate Youth Facilitators

During the first program session, 12 undergraduate facilitators worked with 26 young people aged 9–11 at a local Girls Inc. site to explore a hands-on science activity in small groups. The facilitators worked with small groups of students to lead a science exploration. They guided safe material use and distribution, encouraged discussion, supported sense-making, and acted as peer mentors to the program participants. They also took turns with individual participants to conduct 10- to 15-minute pre-program semi-structured interviews focused on participants' ideas about science, their interests, and their expectations for the program.

The following week, the program moved to the university campus. Pairs of facilitators were each assigned a group of four or five participants, with whom they worked for the rest of the program. During this first visit to the university, the facilitators developed and led icebreaker activities, guided the creation of team names and flags, and worked with participants to develop interview questions to use during visits to scientists' labs. The third and fourth weeks featured lab visits. Facilitators met with their small groups to orient them to the expected roles for that day, as groups rotated the responsibility of documenting the lab visits. Once the small groups were ready, a scientist led the whole group through a lab tour, during which participants asked their interview questions and conducted a hands-on science activity. The undergraduate facilitators participated as co-learners, encouraged active participation by group members, documented the visit through photos and video recordings, and monitored participant behavior for safety in the lab. At the end of each visit, the facilitators guided their groups to create a short video diary.

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During the fifth week of the program, the facilitators led icebreakers they had developed and then worked with participants to reflect on their first two lab visits and revise the interview questions for the next visits. Weeks 6–9 continued with lab visits to a new scientist each week. Under normal circumstances, facilitators would have spent the remaining 10 weeks of the program working with participants to develop a book for young readers (see Arya & McBeath, 2018) and would have conducted final post-program interviews. However, due to the COVID-19 pandemic, the program was placed on hold.

Roles of Undergraduate Teen Facilitators

Like the youth facilitators, the four undergraduate teen facilitators spent the first week at the Girls Inc. site leading participants through a science activity and the interview process. During the second week, after some community-building activities, the facilitators worked with the teens to identify goals for the program. Their culminating event was to be the first annual Youth Summit, an event in which several university-community afterschool programs, including The STEMinist Program, would showcase their efforts in environmental awareness. Because the teen group had only seven members in 2019–2020, the entire group worked together rather than breaking into small groups.

Participants spent four of the next seven weeks working to support the Youth Summit by selecting, designing, and ordering logo-branded merchandise and promotional materials, such as T-shirts and buttons. Undergraduate facilitators supported these efforts by providing resources, collaborating on ideas, and guiding teens through the process of organizing an event. The other three weeks were spent visiting campus scientists and research groups. During these visits, the facilitators served as co-learners while documenting the experience and encouraging participation. This program, too, was cut short by COVID-19, and the Youth Summit had to be postponed.

Program Support for Facilitators

Youth and teen facilitators met with program coordinators 30 minutes before each session to review the day's objectives and discuss ways to support the participants. After each session, the facilitators debriefed, focusing on successes, limitations, and moments of surprise or excitement. Each facilitator also completed digital field notes after each session.

Facilitator Study Informants

A total of 26 undergraduate facilitators supported the 2019–2020 STEMinist program. Of these, 17 worked with the participants as detailed above; the other nine worked as researchers to collect and analyze data and to produce program materials. Our study focused on the 17 undergraduates who worked directly with participants; 13 of them agreed to participate in the study.

Demographic data were collected at the beginning of the program through a digital survey administered by program leaders for funding reporting purposes. Of the 13 study participants, 12 were juniors or seniors and one was a lower-level undergraduate. Three identified as multiethnic, three as White/Caucasian, one as Chicanx/Latinx, and one as Native Hawaiian or other Pacific Islander; five did not disclose their ethnicity. All identified as women.

All participating undergraduates had the option of receiving class credit for their work with the afterschool program. Of the 13 facilitators, two volunteered their time but received no class credit, five received independent research credit, and six received class credit through a community-based learning practicum class, which included a lecture component that the independent study credit did not have.

Data Collection and Analysis

Facilitators were interviewed using a semi-structured interview protocol (Longhurst, 2003) that aimed to understand their background in STEM, their previous experience in facilitating youth STEM programming, and their motivations and expectations for participating in The STEMinist Program. Interviews were conducted by undergraduate research assistants to reduce the effect that age and perceived authority can have on informant responses (Ehrlich & Riesman, 1961).

We used a coding scheme derived from two studies. The first, conducted by Lewis and colleagues (2018), used expectancy-value theory as a framework to investigate the motivations of mentors in a youth engineering program. The authors identified six emergent themes in the motivations for mentors:

1. Positive influences for young girls
2. Influencing younger generations
3. Enjoyment of teaching
4. Joy of engaging in science
5. Teaching encouragement through mentor role
6. Enhanced professional opportunities (Lewis et al., 2018)

As our program participants consisted of girls and nonbinary youth, we discarded motivation 2, influencing younger generations, as a code in favor of motivation 1, positive influences for young girls. We then reworded this code to reflect the wide age range and gender variations among our participants: "positive influences on young STEMinist members."

Lewis and colleagues (2018) situated these themes within the four values of expectancy-value theory outlined by Eccles and Wigfield (2002):

- **Attainment value**: the applicability of performing a task in relation to one's values and identity
- **Intrinsic value**: the fulfillment one receives from performing a task
- **Utility value**: one's understanding of how useful performing the task is to the fulfilment of current and future goals
- **Cost value**: the opportunity cost of performing the task relative to the time and energy required to complete the task

Lewis et al. (2018) did not document evidence of cost value in mentors' motivations. Led by their example, we did not code for cost value.

The second study that informed our coding scheme was conducted by McGuire et al. (2016), who investigated the motivations of youth to join afterschool programs. They captured one motivation not mentioned by Lewis et al. (2018): support for personal goals. We added this motivation to our coding scheme under utility value.

Table 1 outlines how our coding scheme fits within expectancy-value theory and shows the definitions we used to guide our coding process. Four researchers independently coded all 13 interviews using deductive coding methods. Where they disagreed, they deliberated until they reached consensus.

During these discussions, a new theme emerged: lack of STEM programming experience as a child. To situate this new code within the framework, we turned to Eccles and Wigfield (2002) and their expectancy-value theory framework. The best fit for this new code seemed to be attainment value, defined as "the relevance of doing a task that aligns with an individual's beliefs and identity" (Eccles & Wigfield, 2002, p. 4). A lack of childhood STEM experiences seems likely to contribute to an individual's lack of STEM identity as a youth. In the interview responses that fell under this code, facilitators' lack of early STEM experiences led them to believe that young people should have ample opportunities, like the ones afforded by The STEMinist Program, to engage in STEM.

Undergraduate Motivations to Be Youth Program Facilitators

Our analysis of undergraduate facilitators' interview responses about their motivations is organized by the three lenses of expectancy-value theory. Because of the small number of study informants and the limited research on this topic, we did not attempt to identify which motivations were more important than others. Names have been altered to protect informant anonymity.

The Intrinsic Value of Facilitation

Undergraduate facilitators found intrinsic value in their enjoyment of teaching and their joy of engaging in science in The STEMinist Program.

Table 1. Facilitator Motivation Coding Scheme

Value	Code	Definition
Intrinsic	Enjoyment of teaching	Facilitators valued working with youth as educators.
	Joy of engaging in science	Facilitators valued the practices of science and wanted to further their engagement.
Utility	Teaching encouragement through mentor role	Facilitators valued the ways in which participation gave them firsthand experience and expertise as educators.
	Support for personal goals	Facilitators valued the opportunity to further their personal development.
	Enhanced professional opportunity	Facilitators valued the opportunity to further their education or career goals.
Attainment	Positive influences on young STEMinist members	Facilitators valued imparting beneficial skills, opinions, and sentiments to participants.
	Lack of experience in childhood	Facilitators valued creating a STEM experience for youth that they did not have in their childhood.

Enjoyment of Teaching

Four of the 13 interviewees said that The STEMinist Program gave them an opportunity to exercise their enjoyment of teaching or working with youth. When asked why she decided to join the program, Maggie answered, "I just like to educate little kids." Theresa said that she likes "working with little kids a lot." While these two informants emphasized their current enjoyment of working with children, Aaliyah referred to her background in teaching: "I've worked with children for a long time, and [The] STEMinist [Program] is both children and STEM, and I [thought] that's perfect for me." She felt that the program would offer her the opportunity to express her enjoyment of teaching in a content area she also enjoyed. All of these respondents were majoring in science fields, not education.

Joy of Engaging in Science

Five informants said that the intrinsic joy of engaging with science and scientists was a motivation for joining The STEMinist Program. This motivation is not directly related to helping youth engage in STEM; rather, these facilitators saw the program as an opportunity to engage in STEM themselves. The hands-on activities and lab tours were of particular interest to some facilitators. For example, Maggie said that she was "looking forward to going into the labs and helping in that way, because I really do like the idea of seeing hands-on scientists." Pippa explained that she was excited, "because I do like STEM. I'm just not a STEM person." Though she may not embrace a STEM identity, Pippa nevertheless sought to engage in the sciences as an afterschool program facilitator. In addition to the activities and lab tours, undergraduate facilitators expressed enthusiasm for engaging with the university scientists. For example, Tabitha said that she wanted to "know about other scientists … and other people who are experienced in different fields of science."

The Utility Value of Facilitation

Undergraduate facilitators found utility value in the way their mentoring role encouraged them to pursue careers as educators. They also appreciated the support for personal goals and enhanced professional opportunities in The STEMinist Program.

Teaching Encouragement Through Mentor Role

Five of the 13 facilitators said that they valued the education-centered experience they would gain from participating in the program. Some responded similarly to Jean, who said that she was looking forward to "learning more

about teaching strategies. I've always been interested in teaching." Others joined the program with clearly defined learning objectives for educational practices. For example, Aaliyah stated, "I'm actually really interested in seeing how we're going to incorporate the Next Generation Science Standards into writing the curriculum."

These informants viewed participation as an opportunity to enhance their teaching ability in preparation for future careers. Of the five facilitators who said they valued opportunities to improve their teaching skills through their role as mentors, only two planned to pursue education careers. The others wanted to become a public health specialist, a medical doctor, and a professional sports player. Still, they valued the educational experience the program offered. Maggie, the aspiring public health specialist, said that a motivation for her was "improving my skills in education…. I don't want to be a teacher, but … I want to do public health and learn more about the education aspect of it."

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Support for Personal Goals

Another motivating factor, mentioned by 10 of the 13 facilitators, was the support The STEMinist Program offered for the pursuit of personal goals, particularly improving their ability to work with young people or their ability to communicate clearly. The most common goal was an improved ability to work with youth. Several echoed the statement made by Elena, who said, "I'm excited to get more exposure to working with kids." Theresa stated, "I just want to keep honing on my skills on how to interact well with kids." Eliza was more specific, saying she wanted a "different perspective on how to deal with kids, how to manage them in different situations."

Some informants said that they wanted to improve their communication skills. Barbara emphasized improving her communication skills specifically with youth, stating that she had "never worked with teenagers" and thus wanted to improve her interactions with them. Maggie had a different emphasis, saying that her goal was to "broaden my own understanding of science and how I can communicate that with others who may not understand, because sometimes you get so fixated on the direct term that you don't know how to explain that to someone who doesn't understand."

Enhanced Professional Opportunity

Almost half of our informants identified future professional opportunities as a motivation for joining The STEMinist Program. Several echoed Aaliyah, who said she wanted to gain "some more experience with working with children and working with children in STEM specifically. I would like to go into education someday. I'm hoping this would be a way to dip my toes in." Nannie mentioned that she had experience only with preschool children; she "wanted to experience working with teenagers since … that's where I want to work in the future."

The desire for professional development also applied to informants who did not want to pursue careers in education. Barbara, who planned to attend medical school after college, commented that The STEMinist Program was a better fit for her career goals than other organizations: "I've tried different organizations where I realized that I don't think this would help much for [pursuing] medical [careers]." Unlike facilitators who joined this program to improve their teaching skills, Barbara felt that her participation would strengthen her journey toward a career in medicine.

The Attainment Value of Facilitation

Undergraduate facilitators found attainment value in The STEMinist Program in their positive influence on younger girls and in their own lack of personal STEM experience when they were younger.

Positive Influences on Young STEMinist Members

Nine of the 13 informants saw their roles in the program as a way to impart beneficial skills, opinions, and sentiments to youth participants. These facilitators indicated that their desire to have a positive impact on younger people was a driving factor in their participation. When asked about her motivations, Eliza, for example, said that she hoped "to make a positive impact on at least one of the girls." Nina was one of several who suggested that a positive impact could result from a close relationship with program participants; she said, "[I] just hope that I make personal connections with some of the girls and [that] they're positively impacted from this and I have something to do with that."

Within the theme of having a positive influence on younger girls, a sub-theme emerged: increasing diversity and representation in STEM fields. Informants noted that they wanted to support girls' involvement in historically male-dominated fields. For example, Laura said, "I want to support mainly young ladies or young girls, especially if they want to get into a major or into a program that's basically all male dominated… so any way I can support that, I'll do [it]." Facilitators also mentioned that they could be a bridge to STEM for program participants. Ruby said that she wanted "to share my own experiences working with science and tell them what I like about it, and hopefully they like [to] be open to that too."

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Facilitators identified various ways to support the diversification of STEM fields, such as building young people's confidence or fostering their interests. Part of the positive influence Elena wanted to have on program participants was to help them develop confidence. She said her main message was to show "young girls that you can do these things. Like, you don't have to pursue a career in STEM, but you shouldn't feel like you can't just because of who you are." Theresa furthered this idea of building confidence in youth participants, saying that "they need a lot of encouragement and confidence in themselves—especially right now, when they are little. It's when you are little that affects you when you grow up." Several informants echoed this sentiment about involving children in STEM at a young age to foster future interests and careers.

Lack of Experience in Childhood

During the coding process, a new theme emerged that did not fit into the coding framework established by Lewis et al. (2018). Of the 13 informants, four identified a lack of childhood STEM experience as a motivator for joining The STEMinist Program. For example, Tabitha said, "I never got to really experience a cool program like this where I get to talk to scientists and stuff. That's … why I decided to say yes to the facilitator job." Maggie expanded on this idea, explaining that she and her friends in elementary school had tried unsuccessfully to raise money to go to a science camp. Maggie therefore felt a strong desire to provide program participants with the chance she had missed as a child to engage with STEM.

Reflections and Program Recommendations

The rising need for STEM-literate citizens who can address scientific and technological challenges has brought a surge of informal science programs designed to increase young people's interest in STEM. University-community STEM outreach programs typically rely on undergraduate facilitators to be successful. We investigated the motivations of 13 such undergraduate facilitators. By considering the reasons undergraduates choose to participate in STEM programs, program coordinators can give these students targeted opportunities to explore their motivations and build on the values that matter most to them. Below we outline some of the ways The STEMinist Program has addressed intrinsic, utility, and attainment values. Other programs may adopt some of these tactics while exploring other avenues as well.

Building Intrinsic Value

To support facilitators motivated by their enjoyment of teaching, The STEMinist Program gave each facilitator several opportunities to lead group activities. For example, for the second program session, facilitators were asked to plan an hour's worth of activities for their small groups, in which participants would get acquainted, read about the scientists they would be visiting, and develop interview questions to ask on their visits. Program coordinators provided each pair of facilitators with the goals for the session and supported each pair in developing team-building activities. The facilitators created lesson plans and could serve as the lead educators for these sessions.

In response to the findings of this study, in combination with the unprecedented circumstances caused by COVID-19, we invited facilitators who expressed interest in teaching to develop virtual lessons. This new effort positioned undergraduate facilitators as lead teachers. Program coordinators then offered targeted feedback to help facilitators improve their skills in curriculum development.

Facilitators motivated by the joy of engaging in science have been naturally supported by being positioned as co-learners alongside the youth in visits to scientists' labs.

Building Utility Value

Informants who cited utility value as a motivation indicated that program participation enhanced their professional trajectories and supported personal goals. Like those who valued teaching as an intrinsic motivator, some facilitators found opportunities in The STEMinist Program to hone their skills as educators. They practiced and developed their teaching skills through trial and error while receiving weekly feedback and suggestions from program coordinators.

One support for facilitators motivated to hone their teaching skills was the half-hour sessions before program participants arrived, in which program coordinators and facilitators discussed pedagogical strategies and ways to work with youth. After each program session, program coordinators and facilitators met again to reflect on strengths and areas for further development. These metacognitive activities and guided discussions supported the development of strong teaching practices.

In response to the findings from this study, we have restructured what became, during the pandemic, biweekly virtual meetings, adding breakout sessions in which facilitators received tailored tasks and information corresponding to their professional goals. For example, facilitators who were interested in education careers had the option to create at-home science activities, such as one that built understanding of the uniqueness of fingerprints. Facilitators who were interested in graduate school and research careers received information on designing individual research projects and were encouraged to pursue their graduate school interests.

Building Attainment Value

We designed the pre- and post-participation interviews with youth as a way to discern growth among program participants. However, we discovered that, because the undergraduate facilitators conducted these interviews, the interviews could catalyze mentoring relationships between individual facilitators and participants. The post-participation interviews, again intended to be conducted by facilitators, asked the young people to reflect on their time in the program, with an emphasis on the effects on potential career trajectories, STEM interests, and STEM identities. Collecting these data on participants' perceptions of the effects of the program enabled facilitators to see how they have influenced the youth.

To further support undergraduates motivated by a desire to have a positive influence on youth, we decided to extend our programming. Traditionally, we began in January and ended the program in June of the same year. We intended to extend our programming into the fall quarter, to start as early as October, but the pandemic has put plans on hold. Instead, undergraduate facilitators have worked remotely with teen participants as near-peer mentors, supporting participants in the application process and in building a vision for their university life.

By considering the reasons undergraduates choose to participate in STEM programs, program coordinators can give these students targeted opportunities to explore their motivations and build on the values that matter most to them.

Strengthening STEM Outreach Programs

The STEMinist Program was developed with the goal of exposing girls and nonbinary youth to STEM fields in hopes of cultivating STEM interests and identities. However, program coordinators also have a responsibility to support undergraduate facilitators' growth and development. Using the facilitators' motivations for joining the program as a guide, program leaders can better target their efforts to support undergraduates in reaching their goals. We hope this effort will improve outcomes both for undergraduate facilitators and for youth participants in their leadership growth and future aspirations.

Our findings, though derived from undergraduate experiences in a STEM program, may also help non-STEM afterschool programs strengthen their support for undergraduate facilitators. Many of our informants' motivations, such as enjoyment of teaching or having a positive influence on young people, are not unique to STEM. Even STEM-specific motivations, such as joy of engaging in science and lack of STEM experiences in childhood, are likely to be applicable in other disciplines. Any afterschool program that relies on undergraduate facilitators can consider facilitators' motivations in order to enhance their experience.

Our study has some noteworthy limitations. First, although participation in The STEMinist Program was voluntary, some facilitators were part of a community-based practicum class that required participation in a youth program. Six of our 13 interviewees were part

of this practicum, and three mentioned it as a factor in their involvement. Still, these facilitators chose The STEMinist Program out of six program options, so the data on their expectancy-value theory motivations are still useful. In addition, during our time working with facilitators, we noticed underlying motivations that were not mentioned in the pre-program interviews, such as sorority volunteer requirements and a desire to build a strong résumé. Other university-community programs may encounter similar influences for their undergraduate facilitators. Within The STEMinist Program, future research efforts should include more extensive data collection, such as observational notes, to investigate the prevalence and importance of motivational factors beyond the three expectancy-value theory lenses used in this study.

Despite these limitations, our study can help university educators and youth program coordinators maximize the benefits for undergraduate facilitators. By identifying undergraduates' motivations to participate in STEM programming for youth, afterschool programs can evaluate and improve their support for these vital program volunteers.

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